



#11

SEQUENCE LISTING

<110> Perry, Joel

Svendsen, Allan

Andersen, Carsten

Beier, Lars

Frandsen, Torben

<120> Maltogenic Alpha-Amylase Variants

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| Met | Lys | Lys | Lys | Thr | Leu | Ser | Leu | Phe | Val | Gly | Leu | Met | Leu | Leu | Ile | |
| | | | | -30 | | | | -25 | | | | | -20 | | | |

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| ggt | ctt | ctg | ttc | agc | ggt | tct | ctt | ccg | tac | aat | cca | aac | gcc | gct | gaa | 96 |
| Gly | Leu | Leu | Phe | Ser | Gly | Ser | Leu | Pro | Tyr | Asn | Pro | Asn | Ala | Ala | Glu | |
| | -15 | | | | | | -10 | | | | | -5 | | | | |

| | | | | | | | | | | | | | | | | |
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| gcc | agc | agt | tcc | gca | agc | gtc | aaa | ggg | gac | gtg | att | tac | cag | att | atc | 144 |
| Ala | Ser | Ser | Ser | Ala | Ser | Val | Lys | Gly | Asp | Val | Ile | Tyr | Gln | Ile | Ile | |
| -1 | 1 | | | | 5 | | | | 10 | | | | | 15 | | |

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| att | gac | cgg | ttt | tac | gat | ggg | gac | acg | acg | aac | aac | aat | cct | gcc | aaa | 192 |
| Ile | Asp | Arg | Phe | Tyr | Asp | Gly | Asp | Thr | Thr | Asn | Asn | Asn | Pro | Ala | Lys | |
| | | | 20 | | | | | 25 | | | | | | 30 | | |

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| agt | tat | gga | ctt | tac | gat | ccg | acc | aaa | tcg | aag | tgg | aaa | atg | tat | tgg | 240 |
| Ser | Tyr | Gly | Leu | Tyr | Asp | Pro | Thr | Lys | Ser | Lys | Trp | Lys | Met | Tyr | Trp | |
| | | | 35 | | | | | 40 | | | | | 45 | | | |

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| ggc | ggg | gat | ctg | gag | ggg | gtt | cgt | caa | aaa | ctt | cct | tat | ctt | aaa | cag | 288 |
| Gly | Gly | Asp | Leu | Glu | Gly | Val | Arg | Gln | Lys | Leu | Pro | Tyr | Leu | Lys | Gln | |
| | | 50 | | | | | 55 | | | | | 60 | | | | |

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| ctg | ggc | gta | acg | aca | atc | tgg | ttg | tcc | ccg | gtt | ttg | gac | aat | ctg | gat | 336 |
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| | |
|---|------|
| Leu Gly Val Thr Thr Ile Trp Leu Ser Pro Val Leu Asp Asn Leu Asp | |
| 65 70 75 | |
| aca ctg gcg ggc acc gat aac acg ggc tat cac gga tac tgg acg cgc | 384 |
| Thr Leu Ala Gly Thr Asp Asn Thr Gly Tyr His Gly Tyr Trp Thr Arg | |
| 80 85 90 95 | |
| gat ttt aaa cag att gag gaa cat ttc ggg aat tgg acc aca ttt gac | 432 |
| Asp Phe Lys Gln Ile Glu Glu His Phe Gly Asn Trp Thr Thr Phe Asp | |
| 100 105 110 | |
| acg ttg gtc aat gat gct cac caa aac gga atc aag gtg att gtc gac | 480 |
| Thr Leu Val Asn Asp Ala His Gln Asn Gly Ile Lys Val Ile Val Asp | |
| 115 120 125 | |
| ttt gtg ccc aat cat tcg act cct ttt aag gca aac gat tcc acc ttt | 528 |
| Phe Val Pro Asn His Ser Thr Pro Phe Lys Ala Asn Asp Ser Thr Phe | |
| 130 135 140 | |
| gcg gaa ggc ggc gcc ctc tac aac aat gga acc tat atg ggc aat tat | 576 |
| Ala Glu Gly Gly Ala Leu Tyr Asn Asn Gly Thr Tyr Met Gly Asn Tyr | |
| 145 150 155 | |
| ttt gat gac gca aca aaa ggg tac ttc cac cat aat ggg gac atc agc | 624 |
| Phe Asp Asp Ala Thr Lys Gly Tyr Phe His His Asn Gly Asp Ile Ser | |
| 160 165 170 175 | |
| aac tgg gac gac cgg tac gag gcg caa tgg aaa aac ttc acg gat cca | 672 |
| Asn Trp Asp Asp Arg Tyr Glu Ala Gln Trp Lys Asn Phe Thr Asp Pro | |
| 180 185 190 | |
| gcc ggt ttc tcg ctt gcc gat ttg tcg cag gaa aat ggc acg att gct | 720 |
| Ala Gly Phe Ser Leu Ala Asp Leu Ser Gln Glu Asn Gly Thr Ile Ala | |
| 195 200 205 | |
| caa tac ctg acc gat gcg gcg gtt caa ttg gta gca cat gga gcg gat | 768 |
| Gln Tyr Leu Thr Asp Ala Ala Val Gln Leu Val Ala His Gly Ala Asp | |
| 210 215 220 | |
| ggt ttg cgg att gat gcg gtg aag cat ttt aat tcg ggg ttc tcc aaa | 816 |
| Gly Leu Arg Ile Asp Ala Val Lys His Phe Asn Ser Gly Phe Ser Lys | |
| 225 230 235 | |
| tcg ttg gcc gat aaa ctg tac caa aag aaa gac att ttc ctg gtg ggg | 864 |
| Ser Leu Ala Asp Lys Leu Tyr Gln Lys Lys Asp Ile Phe Leu Val Gly | |
| 240 245 250 255 | |
| gaa tgg tac gga gat gac ccc gga aca gcc aat cat ctg gaa aag gtc | 912 |
| Glu Trp Tyr Gly Asp Asp Pro Gly Thr Ala Asn His Leu Glu Lys Val | |
| 260 265 270 | |
| cgg tac gcc aac aac agc ggt gtc aat gtg ctg gat ttt gat ctc aac | 960 |
| Arg Tyr Ala Asn Asn Ser Gly Val Asn Val Leu Asp Phe Asp Leu Asn | |
| 275 280 285 | |
| acg gtg att cga aat gtg ttc ggc aca ttt acg caa acg atg tac gat | 1008 |
| Thr Val Ile Arg Asn Val Phe Gly Thr Phe Thr Gln Thr Met Tyr Asp | |

| 290 | 295 | 300 | |
|---|-----|-----|------|
| ctt aac aat atg gtg aac caa acg ggg aac gag tac aaa tac aaa gaa Leu Asn Asn Met Val Asn Gln Thr Gly Asn Glu Tyr Lys Tyr Lys Glu 305 310 315 | | | 1056 |
| aat cta atc aca ttt atc gat aac cat gat atg tca aga ttt ctt tcg Asn Leu Ile Thr Phe Ile Asp Asn His Asp Met Ser Arg Phe Leu Ser 320 325 330 335 | | | 1104 |
| gta aat tcg aac aag gcg aat ttg cac cag gcg ctt gct ttc att ctc Val Asn Ser Asn Lys Ala Asn Leu His Gln Ala Leu Ala Phe Ile Leu 340 345 350 | | | 1152 |
| act tcg cgg ggt acg ccc tcc atc tat tat gga acc gaa caa tac atg Thr Ser Arg Gly Thr Pro Ser Ile Tyr Tyr Gly Thr Glu Gln Tyr Met 355 360 365 | | | 1200 |
| gca ggc ggc aat gac ccg tac aac cgg ggg atg atg ccg gcg ttt gat Ala Gly Gly Asn Asp Pro Tyr Asn Arg Gly Met Met Pro Ala Phe Asp 370 375 380 | | | 1248 |
| acg aca acc acc gcc ttt aaa gag gtg tca act ctg gcg ggg ttg cgc Thr Thr Thr Thr Ala Phe Lys Glu Val Ser Thr Leu Ala Gly Leu Arg 385 390 395 | | | 1296 |
| agg aac aat gcg gcg atc cag tac ggc acc acc acc cag cgt tgg atc Arg Asn Asn Ala Ala Ile Gln Tyr Gly Thr Thr Thr Gln Arg Trp Ile 400 405 410 415 | | | 1344 |
| aac aat gat gtt tac att tat gaa cgg aaa ttt ttc aac gat gtc gtg Asn Asn Asp Val Tyr Ile Tyr Glu Arg Lys Phe Phe Asn Asp Val Val 420 425 430 | | | 1392 |
| ttg gtg gcc atc aat cga aac acg caa tcc tcc tat tcg att tcc ggt Leu Val Ala Ile Asn Arg Asn Thr Gln Ser Ser Tyr Ser Ile Ser Gly 435 440 445 | | | 1440 |
| ttg cag acg gcc ttg cca aat ggc agc tat gcg gat tat ctg tca ggg Leu Gln Thr Ala Leu Pro Asn Gly Ser Tyr Ala Asp Tyr Leu Ser Gly 450 455 460 | | | 1488 |
| ctg ttg ggg ggg aac ggg att tcc gtt tcc aat gga agt gtc gct tcg Leu Leu Gly Gly Asn Gly Ile Ser Val Ser Asn Gly Ser Val Ala Ser 465 470 475 | | | 1536 |
| ttc acg ctt gcg cct gga gcc gtg tct gtt tgg cag tac agc aca tcc Phe Thr Leu Ala Pro Gly Ala Val Ser Val Trp Gln Tyr Ser Thr Ser 480 485 490 495 | | | 1584 |
| gct tca gcg ccg caa atc gga tcg gtt gct cca aat atg ggg att ccg Ala Ser Ala Pro Gln Ile Gly Ser Val Ala Pro Asn Met Gly Ile Pro 500 505 510 | | | 1632 |
| ggg aat gtg gtc acg atc gac ggg aaa ggt ttt ggg acg acg cag gga Gly Asn Val Val Thr Ile Asp Gly Lys Gly Phe Gly Thr Thr Gln Gly 515 520 525 | | | 1680 |

acc gtg aca ttt ggc gga gtg aca gcg act gtg aaa tcc tgg aca tcc 1728
 Thr Val Thr Phe Gly Gly Val Thr Ala Thr Val Lys Ser Trp Thr Ser
 530 535 540

aat cgg att gaa gtg tac gtt ccc aac atg gcc gcc ggg ctg acc gat 1776
 Asn Arg Ile Glu Val Tyr Val Pro Asn Met Ala Ala Gly Leu Thr Asp
 545 550 555

gtg aaa gtc acc gcg ggt gga gtt tcc agc aat ctg tat tct tac aat 1824
 Val Lys Val Thr Ala Gly Gly Val Ser Ser Asn Leu Tyr Ser Tyr Asn
 560 565 570 575

att ttg agt gga acg cag aca tcg gtt gtg ttt act gtg aaa agt gcg 1872
 Ile Leu Ser Gly Thr Gln Thr Ser Val Val Phe Thr Val Lys Ser Ala
 580 585 590

cct ccg acc aac ctg ggg gat aag att tac ctg acg ggc aac ata ccg 1920
 Pro Pro Thr Asn Leu Gly Asp Lys Ile Tyr Leu Thr Gly Asn Ile Pro
 595 600 605

gaa ttg ggg aat tgg agc acg gat acg agc gga gcc gtt aac aat gcg 1968
 Glu Leu Gly Asn Trp Ser Thr Asp Thr Ser Gly Ala Val Asn Asn Ala
 610 615 620

caa ggg ccc ctg ctc gcg ccc aat tat ccg gat tgg ttt tat gta ttc 2016
 Gln Gly Pro Leu Leu Ala Pro Asn Tyr Pro Asp Trp Phe Tyr Val Phe
 625 630 635

agc gtt cca gca gga aag acg att caa ttc aag ttc ttc atc aag cgt 2064
 Ser Val Pro Ala Gly Lys Thr Ile Gln Phe Lys Phe Phe Ile Lys Arg
 640 645 650 655

gcg gat gga acg att caa tgg gag aat ggt tcg aac cac gtg gcc aca 2112
 Ala Asp Gly Thr Ile Gln Trp Glu Asn Gly Ser Asn His Val Ala Thr
 660 665 670

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Ala Ser Ser Ser Ala Ser Val Lys Gly Asp Val Ile Tyr Gln Ile Ile
 -1 1 5 10 15

Ile Asp Arg Phe Tyr Asp Gly Asp Thr Thr Asn Asn Asn Pro Ala Lys
 20 25 30

Ser Tyr Gly Leu Tyr Asp Pro Thr Lys Ser Lys Trp Lys Met Tyr Trp
 35 40 45

Gly Gly Asp Leu Glu Gly Val Arg Gln Lys Leu Pro Tyr Leu Lys Gln
 50 55 60

Leu Gly Val Thr Thr Ile Trp Leu Ser Pro Val Leu Asp Asn Leu Asp
 65 70 75

Thr Leu Ala Gly Thr Asp Asn Thr Gly Tyr His Gly Tyr Trp Thr Arg
 80 85 90 95

Asp Phe Lys Gln Ile Glu Glu His Phe Gly Asn Trp Thr Thr Phe Asp
 100 105 110

Thr Leu Val Asn Asp Ala His Gln Asn Gly Ile Lys Val Ile Val Asp
 115 120 125

Phe Val Pro Asn His Ser Thr Pro Phe Lys Ala Asn Asp Ser Thr Phe
 130 135 140

Ala Glu Gly Gly Ala Leu Tyr Asn Asn Gly Thr Tyr Met Gly Asn Tyr
 145 150 155

Phe Asp Asp Ala Thr Lys Gly Tyr Phe His His Asn Gly Asp Ile Ser
 160 165 170 175

Asn Trp Asp Asp Arg Tyr Glu Ala Gln Trp Lys Asn Phe Thr Asp Pro
 180 185 190

Ala Gly Phe Ser Leu Ala Asp Leu Ser Gln Glu Asn Gly Thr Ile Ala
 195 200 205

Gln Tyr Leu Thr Asp Ala Ala Val Gln Leu Val Ala His Gly Ala Asp
 210 215 220

Gly Leu Arg Ile Asp Ala Val Lys His Phe Asn Ser Gly Phe Ser Lys

225

230

235

Ser Leu Ala Asp Lys Leu Tyr Gln Lys Lys Asp Ile Phe Leu Val Gly
 240 245 250 255

Glu Trp Tyr Gly Asp Asp Pro Gly Thr Ala Asn His Leu Glu Lys Val
 260 265 270

Arg Tyr Ala Asn Asn Ser Gly Val Asn Val Leu Asp Phe Asp Leu Asn
 275 280 285

Thr Val Ile Arg Asn Val Phe Gly Thr Phe Thr Gln Thr Met Tyr Asp
 290 295 300

Leu Asn Asn Met Val Asn Gln Thr Gly Asn Glu Tyr Lys Tyr Lys Glu
 305 310 315

Asn Leu Ile Thr Phe Ile Asp Asn His Asp Met Ser Arg Phe Leu Ser
 320 325 330 335

Val Asn Ser Asn Lys Ala Asn Leu His Gln Ala Leu Ala Phe Ile Leu
 340 345 350

Thr Ser Arg Gly Thr Pro Ser Ile Tyr Tyr Gly Thr Glu Gln Tyr Met
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Ala Gly Gly Asn Asp Pro Tyr Asn Arg Gly Met Met Pro Ala Phe Asp
 370 375 380

Thr Thr Thr Thr Ala Phe Lys Glu Val Ser Thr Leu Ala Gly Leu Arg
 385 390 395

Arg Asn Asn Ala Ala Ile Gln Tyr Gly Thr Thr Thr Gln Arg Trp Ile
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Asn Asn Asp Val Tyr Ile Tyr Glu Arg Lys Phe Phe Asn Asp Val Val
 420 425 430

Leu Val Ala Ile Asn Arg Asn Thr Gln Ser Ser Tyr Ser Ile Ser Gly
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Leu Gln Thr Ala Leu Pro Asn Gly Ser Tyr Ala Asp Tyr Leu Ser Gly
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Leu Leu Gly Gly Asn Gly Ile Ser Val Ser Asn Gly Ser Val Ala Ser
465 470 475

Phe Thr Leu Ala Pro Gly Ala Val Ser Val Trp Gln Tyr Ser Thr Ser
480 485 490 495

Ala Ser Ala Pro Gln Ile Gly Ser Val Ala Pro Asn Met Gly Ile Pro
500 505 510

Gly Asn Val Val Thr Ile Asp Gly Lys Gly Phe Gly Thr Thr Gln Gly
515 520 525

Thr Val Thr Phe Gly Gly Val Thr Ala Thr Val Lys Ser Trp Thr Ser
530 535 540

Asn Arg Ile Glu Val Tyr Val Pro Asn Met Ala Ala Gly Leu Thr Asp
545 550 555

Val Lys Val Thr Ala Gly Gly Val Ser Ser Asn Leu Tyr Ser Tyr Asn
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Ile Leu Ser Gly Thr Gln Thr Ser Val Val Phe Thr Val Lys Ser Ala
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Pro Pro Thr Asn Leu Gly Asp Lys Ile Tyr Leu Thr Gly Asn Ile Pro
595 600 605

Glu Leu Gly Asn Trp Ser Thr Asp Thr Ser Gly Ala Val Asn Asn Ala
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Gln Gly Pro Leu Leu Ala Pro Asn Tyr Pro Asp Trp Phe Tyr Val Phe
625 630 635

Ser Val Pro Ala Gly Lys Thr Ile Gln Phe Lys Phe Phe Ile Lys Arg
640 645 650 655

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